

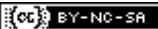
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On the Habits of Certain "Harvesting" Ants.

(WITH PLATE.)

Genus.—*Holcomyrmex*, Mayr.

(Described as a new genus—Mayr Verhand : k.k. Zool-botan Gesell : Wein 1878.)

Species.—*H. scabriceps*, Mayr—*H. criniceps*, Mayr.

BY

SURGEON J. H. T. WALSH.

One day during January 1889 my attention was attracted by a long train of ants which was wending its way across an unfrequented corner of the Puri Jai compound. I noticed that all the ants who were hastening towards the nest carried in their mandibles the seeds of certain grasses. In one or two cases two or three ants were engaged in dragging along entire spikelets. Following the train I came upon the nest, the opening to which was in the centre of a large crater-like midden. The midden was composed of the sand dug out of the nest, and over this, almost hiding it, lay a large quantity of chaff and husks from the various seeds which the ants must have collected during the harvesting season. Having read Moggridge's work on the harvesting ants of the south of France, I was naturally much interested in this "find," and I examined the ants to see whether they corresponded with the description which Moggridge gives of the harvesting aphænogasters. As the ants were quite strange to me I collected some, and at the same time took some of the seeds and grasses. The seeds were identified by Mr. Duthie and Dr. Prain as those of *Eragrostis plumosa*, *Sporobolus* (*sp.?*) and *Cynodon dactylon*. The last-mentioned grass—the "dubh grass"—seemed to be a great favourite with the ants. Through the courtesy of Mr. Cotes, of the Indian Museum, the ants collected by me were forwarded to Professor A. Forel for identification. Dr. Forel identified the ants as belonging to the species *Holcomyrmex scabriceps*, Mayr, and in his letter noticed that Audré had already supposed these ants to be "harvesters" from the appearance of the mandibles. I have referred to Audré's work, "Les Fourmis," and find that he merely mentions *Holcomyrmex* as a harvesting genus, but gives no details. Dr. Forel further pointed out that there are two other species belonging to this genus in India, and I afterwards found nests of *H. criniceps*, Mayr; but have not yet met with the third species, *H. glaber*, Audré. There is a specimen of *H. glaber* in the

Indian Museum collection. The observations in this paper refer to *H. scabriceps* and *H. criniceps* indifferently, as their habits and methods of working are, so far as I can see, identical. During 1889 and the early months of 1890 I observed several nests of both species either near the town of Puri or in the district; indeed, both kinds are rather common, frequenting "bunds," the banks of roads, the borders of fields and open grassy spots. I have lately (March 17th, 1890) found two nests of *H. scabriceps* on the Calcutta *maidan*. The nest, which is always in the ground, has no dome or "hill" over it, and generally only one opening in the centre of the crateriform midden. The main entrance leads into a passage from which numerous other passages branch horizontally and obliquely in all directions leading to the chambers in which the ants live and to the granaries. The passages are very narrow and the chambers often at a considerable distance from the main entrance to the nest, and this, as I shall have occasion to mention further on, makes it difficult to find the stores of grain. In some cases there may be a second or even three openings to the nest, and if the main entrance is disturbed or blocked up, another door will be formed close by. It takes a great deal of disturbance to make these ants forsake their nest.

The active members of the community consist of an elephant-headed soldier, a worker major, and a worker minor. On dry days all through the cold weather the ants may be seen harvesting for the greater part of the day. Sometimes, however, they are seen in the morning or in the evening, and again on certain days hardly any ants go out harvesting, and only a few ♀ are seen bringing chaff out of the nest. I think it probable that on such occasions all the members of the community may be helping to clean and store seeds already harvested. The ants, when starting off to work, leave their nest in a long regular train, two or three deep; the ♂, few in number, running alongside the column and often running backwards and forwards. They first attack the grasses and plants in the immediate vicinity of the nest, but when this supply is scanty or exhausted, they range further afield. I measured (17th January 1890) a train of ants over fifteen yards long moving along a well-worn path and reaching from the nest into a small garden, near the forest bungalow in Khurda, where the workers were collecting grass seeds. When the harvesting ground is reached the line breaks up; the ♀ climb up the grass stalks and with their sharp-toothed mandibles saw at the base of the seed, cutting it off with all its envelopes. Having cut away a seed or small spikelet, the ant either brings it down and returns to the nest, or drops it for other workers to carry away. The cutting of the crops is generally, though not always, done by the ♀ major, while small ♀ collect seeds which have fallen to the ground and act generally as gleaners. I have never seen the large-headed ♂ cutting off seeds, though they sometimes carry them. Their mandibular teeth differ from those of the large and small ♀ and are broad and blunt.

The seeds, of whatever kind, are always carried into the nest with their envelopes and are cleaned inside the nest; the chaff is carefully thrown out on the

midden and all the seeds found in the granaries are beautifully clean. I have never found any débris of insects in the middens, nor have I ever noticed these ants carrying insects into their nests. If an insect is placed near them they do not, as a rule, take much notice of it. For a long time after I first began to observe these ants I failed entirely to find a perfect granary, although I frequently found a few seeds in the earth turned up. The reason of my want of success lay in my failing to understand the structure of the nest. After a time I gave up digging down on the main entrance and took to making tentative thrusts with the trowel in various directions at various distances from the opening to the nest, and often with success. It was not, however, until the 27th October 1889 that I succeeded in obtaining an entire undamaged granary. This I dug up from a nest of *H. criniceps* in the clayey soil in the Puri Jail garden. This granary was at the end of an almost horizontal passage; in shape irregularly round and somewhat larger than a hazelnut. Its walls were firm and it contained three hundred and five seeds of *Amaranthus gangeticus*, grown as a vegetable in the garden and in seed at the time, and twenty-two seeds of *Scirpus barbatus*, of which only a few plants could be seen near the nest. This was, I think, a small granary. I have seen some which must have been as large as a walnut when entire. Moggridge speaks of granaries as large as a gentleman's gold watch which he found in the nests of *Atta barbara*.

It is, of course, impossible to count all the seeds in any one nest, but—making allowance for chaff representing grain used for daily consumption—at the end of the cold season a large nest must, judging from the amount of chaff on the midden, contain a fairly large store.

My observation diary shows that the ants worked regularly from the time I first noticed them, in January, until the end of March 1889. All through the hot months (April, May) and during the early part of the "rains" the ants remained quiet within their nests; but about the 18th June there was a spell of fine weather following after rain, and I find the following entry:—

"Nest of *H. criniceps* in Police compound. Some ants came out and collected seeds from a small patch of *Cynodon dactylon*, about ten yards away from the nest." Rain came on again, and from the 23rd June to the 10th July no ants were to be seen.—*July 10th*: "Two or three days fine weather, have brought out *H. scabriceps* in the Jail compound. Judging by the number of nests seen at work during the cold weather, I think that the *H. scabriceps* here referred to and the *H. criniceps*, who were seen harvesting in June, must have been forced to come out as supplies were running short."—*July 28th*: "About the 20th rain set in again, driving back the ants; rained steadily till the 28th. This day fine, but though other ants that do not store were seen, *Holcomyrmex* was not seen."

All through the cold season of 1889-90 the ants worked steadily. Generally speaking, then, the period of active work is from September to April, when the heat compels the ants to retire into the deeper parts of the nest, where they

remain more or less torpid, finding sufficient for their wants in the stores of grain remaining at the end of the harvesting season. No doubt where the heat is less, or the nest sheltered, the ants work on up to the rains, and as I have shown they occasionally come out even during the "rains," when there is an interval of fine weather. In such cases the necessity for extensive storing would be lessened.

When we consider the formation of the mouth parts of an ant it seems evident that they cannot eat seeds which have become hard and dry, and must store them until the starch in the seed is changing into sugar, when they tear through the testa and suck out the sweet juice: "Exactement comme les chiens lorsqu'ils lapent ou lorsqu'ils lèchent le fond d'une assiette" (*Forel—Les Fourmis de la Suisse*, page 108). The uneaten débris is then carefully removed from the nest and thrown on to the midden.

The object of storing is not only, in my opinion, to provide for the future, since I believe the ants are nearly torpid all through the hot season, or may in some cases go on working, but to allow the seeds time to become so altered that they can be used as food. No doubt with fresh green seeds, many of which the ants collect, the juices are sucked out at once without any storing. It is worthy of notice that, although the "harvesters" collect seeds, from a great variety of plants, they show a decided preference for grass seeds, probably because these seeds contain a large amount of starch available as sugar when fermentation takes place.

The following is a list of a few only of the plants and grasses from which I have seen the ants cutting their crops:—

1. <i>Scirpus barbatus</i> .	5. <i>Panicum indicum</i> .
2. <i>Eragrostis plumosa</i> .	6. <i>Amaranthus gangeticus</i> .
3. <i>Perotis latifolia</i> .	7. <i>Cynodon dactylon</i> .
4. <i>Eleusine aegyptiaca</i> .	

For the botanical names of the above I am much indebted to the kindness of Mr. Duthie and Dr. Prain. These agricultural ants are a hard-working, peaceful race not given to fighting. They are not, however, wanting in courage and will attack any strange ants placed close to their nest. Their sting is small and feeble, but their strong mandibles would form excellent weapons of offence or defence. Their communities vary from small nests containing only a few hundred individuals to large and long-established dwellings containing thousands. With one large nest I made a rough calculation which gave at least eight thousand as the population of the nest. The nests are generally solitary, and *Holcomyrmex* do not form colonies of any extent as other ants do. *H. scabriceps* and *H. criniceps* do not appear to harbour guests in their dwellings. I have occasionally seen one or two *Lepismidæ*, but their presence was probably accidental. On the midden there may almost always be found several small black beetles. These probably feed on the vegetable débris and lay their eggs in the midden. The ants never molest them, but seem to take no notice of them.

The harvesting ants of the south of India have been described by Sykes and Jerdon and include *Pheidole providens*, West. This ant is not found in Puri, but I have noticed that *Pheidole indica*, Mayr, sometimes carry fallen seeds, though their chief food is insects. On the authority of Mr. Horn (ref. Moggridge "Harvesting Ants and Trapdoor Spiders," pp. 66-67, edition 1873) *Sima (Pseudomyrma) rufo-nigra*, Jerdon, is included among the harvesting ants. It would be rash for me to say that this species does not harvest in some part of India, but it certainly does not in Orissa. I have had several nests under observation in the neighbourhood of Puri for more than a year. Mr. Horn is quoted (*loc. cit.*) as saying that the ants he noticed in Mainpuri were "of a medium size, shortish bodies, and of a reddish brown colour.—*Pseudomyrma rufo-nigra*." The ♀ of *Sima rufo-nigra* measures 10 mm.; the head, abdomen and 2nd node of the petiole shiny brownish black; thorax and 1st node of the petiole bright yellowish red; the body is long and slender; nest in the dry wood of trees; food insects. Perhaps Mr. Horn did not correctly identify the ants seen by him.

I have never seen *Holcomyrmex* bringing up seeds to dry after rain, nor can I help to solve the problem as to why the seeds do not germinate in the granaries. I have examined a great many seeds, but never saw any signs of germination. Seeds taken at various periods have always germinated when placed in moist warm earth. Perhaps, after all, there is not much mystery surrounding the non-germination of the seeds in the granaries. All that is required is that the seeds shall be kept dry, and this may be done with little trouble. No doubt the ants examine their store-rooms frequently and use for immediate consumption any seeds in which germination has commenced; or, biting off the radicle, remove them to a drier part of the nest.

Dr. Forel tells me that the ♂ and ♀ of *H. scabriceps* have been, up to the present, unknown, and I take this opportunity of describing the solitary specimen of the ♀ which I dug out of a nest on the 7th October 1889. Her wings had been stripped off and she was evidently about to lay her eggs. I failed to detect the period of the conjugal flight, but suppose it to take place some time in September; this supposition however needs confirmation. The male I have not yet found.

Holcomyrmex scabriceps, Mayr ♀; (agrees generally with the generic description given by Dr. Mayr). Length 10 mm. head 2 mm., thorax 3·4 mm., abdomen including the petiole nearly 5 mm. Mandibles black, stumpy, with indistinct broad, blunt teeth, marked with a few coarse striæ and slightly hairy. Antennæ dark reddish brown, 12 joints; scape inserted close to anterior margin of head, richly covered with small hairs; when folded back does not reach to the posterior angle of the head. Flagellum only moderately clubbed, apical joint nearly as long as the two next, short strong hairs on the segments. Eyes round, black, small and not prominent; ocelli pearly white. Head ferruginous,

striated longitudinally and covered with very fine white hairs; head, without mandibles, almost square, wider behind than in front, slightly concave behind in the centre of the occipital margin, posterior angles rounded; the small triangular portion of the vertex enclosed by the ocelli is reddish black and the angles appear raised to form partial sockets for the ocelli. Thorax nigro-ferruginous and shining on the upper surface, lighter at the sides and beneath, somewhat rugose at the sides and generally hairy; pronotum small, mesonotum large and very convex in front, grooves between mesonotum, scutellum, post-scutellum and metanotum distinct; basal portion of metanotum with slightly irregular transverse striæ. First node of the petiole somewhat conical, rounded on the top; second node round and almost sessile on the abdomen; color as head, but lighter beneath and at the sides, upper surface of nodes darker than other parts; a few strong hairs on the posterior aspect of each node, more marked on the first. Abdomen brownish-black, shining, oval, truncated in front and not very pointed behind, covered with small strong whitish hairs; first segment very large, occupying half the abdomen. Legs: coxae pale rust red, femora and tibiæ blackish brown and shining, tarsi rust red. Wings unknown.

The individuals which I have called soldiers are, with the head stretched out, about 7·5 mm. long and remarkable for the "elephantine" appearance of the head, which measures 2·3 by 2 mm. in the widest part. What their particular functions may be I am not able to say with certainty; they do not harvest, and their teeth are too blunt for seed-cleaning. They act, I think, as pioneers, road-makers, &c., and with their large heads would be able to block up the entrance to the nest in case of invasion. The measurements given by Dr. Mayr for the ♀ major and ♀ minor are 5·2 mm. and 3·8 mm. respectively, and these correspond nearly with the specimens in my collections. The three mandibular teeth are strong and well defined in the ♀ major, but are less sharp than those of the small worker.

NOTE.—Since this paper was written and sent to the Editor, I have come across a note on the habits of *Holcomyrmex* by Mr. G. A. J. Rothney, who observed them near Barrackpur. (*J. Bomb. Nat. Hist. Soc.* No. 1, Vol. V, 1890, p. 57).—J. H. T. W., 10-2-91.

Description of Plate.

Holcomyrmex scabriceps.

- a worker major (about natural size).
- b " minor "
- c soldier "
- d female "
- A worker major (enlarged).
- B " minor "
- C soldier "
- D female "

HOLCOMYRMEX SCABRICEPS (about natural size).



HOLCOMYRMEX SCABRICEPS (enlarged).

